

**REMARKS**

Applicants thank the Examiner for the very thorough consideration given the present application. Claims 1 and 3-22 are currently pending in this application. Claims 3 and 4 have been withdrawn from further consideration. No new matter has been added by way of the present amendment. For instance, the amendment to claim 1 finds support at, for example, page 15, lines 23-31 of the present Specification. New claims 21 and 22 are supported by the Specification at, for example, page 14, line 20 to page 15, line 13. Accordingly, no new matter has been added.

At the outset, the present application is believed to be in condition for allowance. Entry of the accompanying amendment is requested under 37 C.F.R. §1.116, as the amendment does not raise any new issues which would require further search and/or consideration by the Examiner. Furthermore, Applicants request entry of this amendment in order to place the claims in better form for consideration on Appeal.

In view of the amendments and remarks herein, Applicants respectfully request that the Examiner withdraw all outstanding rejections and allow the currently pending claims.

**Issues Under 35 U.S.C. § 103(a)**

**Claims 1, 5-14 and 17-20**

Claims 1, 5-14 and 17-20 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Fenton et al. (U.S. 6,456,136) (hereinafter Fenton '136). Applicants respectfully traverse.

The Examiner asserts that Fenton '136 discloses a composite membrane structure comprising a porous polymeric matrix and a protective layer disposed adjacent to the porous polymeric matrix. The Examiner further asserts that the porous polymeric layer has a pore

diameter of 0.025 $\mu$ m to about 1 $\mu$ m. Furthermore, the Examiner asserts that the protective layer comprises a binder, an ionically conductive solid, and a hygroscopic powder.

Applicants respectfully submit that the Examiner has failed to establish a *prima facie* case of obviousness. To establish a *prima facie* case of obviousness, the prior art reference (or references when combined) must teach or suggest all the claim limitations. *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991). Additionally, there must be a reason why one of ordinary skill in the art would modify the reference or combine reference teachings to obtain the invention. A patent composed of several elements is not proved obvious merely by demonstrating that each of its elements was, independently, known in the prior art. *KSR Int'l Co. v Teleflex Inc.*, 82 USPQ2d 1385 (U.S. 2007). There must be a reason that would have prompted a person of ordinary skill in the relevant field to combine the elements in the way the claimed new invention does. *Id.* The Supreme Court of the United States has recently held that the "teaching, suggestion, motivation test" is a valid test for obviousness, albeit one which cannot be too rigidly applied. *Id.* Rejections on obviousness grounds cannot be sustained by mere conclusory statements; instead, there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness. *Id.*

The present invention is directed, *inter alia*, to an ion exchange membrane comprising a porous film and a surface layer, wherein the pores of the porous film are filled with a crosslinked ion exchange resin and the surface layer comprises a crosslinked ion exchange resin and a lamellar particle. In the presently claimed ion exchange membrane (see, for example, claim 1), both the crosslinked ion exchange resin which fills the pores of the porous film layer (A) and the crosslinked ion exchange resin which comprises the surface layer are produced from at least one

crosslinkable monomer selected from the group consisting of a polyfunctional vinyl monomer and a polyfunctional methacrylic acid derivative monomer, wherein the polyfunctional vinyl monomer is at least one selected from the group consisting of divinylbenzene, divinylsulfone, butadiene, chloroprene, divinylbisphenyl and trivinylbenzene.

At page 4, lines 7-12 (see also page 6, lines 8-10) of the Office Action of April 25, 2008, the Examiner asserts that *“polystyrene is an aromatic polymer made from the aromatic monomer styrene (styrene is also known as vinyl benzene). Therefore, polystyrene sulfonic acid is a polyfunctional vinyl compound with the vinyl group being one functional group and the sulfonic acid group being a second functional group.”*

In the Advisory Action of August 25, 2008, the Examiner again takes the position that the polystyrene sulfonic acid of Fenton '136 is a polyfunctional vinyl compound which meets the inventive limitation of a “polyfunctional vinyl monomer”. The Examiner rationalizes that polystyrene sulfonic acid is polyfunctional, since it has more than one sulfonic acid group as pendant groups along the chain. Applicants respectfully disagree.

Although polystyrene is an aromatic polymer made from the aromatic monomer styrene (styrene is also known as vinyl benzene, as correctly asserted by the Examiner), polystyrene does not have a vinyl group. Polystyrene sulfonic acid is a monofunctional compound with the sulfonic acid group being the sole functional group. Applicants respectfully submit that the polystyrene sulfonic acid would no longer be considered as containing vinyl groups, as required by inventive claim 1, as the vinyl groups (CH<sub>2</sub>=CH)- are converted to ethyl groups -(CH<sub>2</sub>-CH)-. As is well known in the art, a vinyl group is a terminal group having a carbon-carbon double bond, whereas an ethyl group is linked at both ends and only contains a carbon-carbon single

bond. As such, polystyrene sulfonic acid would not be considered a polyfunctional vinyl compound. It is evident that the obtained polystyrene does not have the vinyl group of the styrene monomer which was polymerized. Therefore, polystyrene sulfonic acid is a monofunctional compound with the sulfonic acid group being the sole functional group.

Evidently, Fenton '136 fails to teach or suggest an ion exchange membrane as presently claimed, comprising a crosslinked ion exchange resin produced from at least one crosslinkable monomer selected from the group consisting of a polyfunctional vinyl monomer and a polyfunctional methacrylic acid derivative monomer, wherein the polyfunctional vinyl monomer is at least one selected from the group consisting of divinylbenzene, divinylsulfone, butadiene, chloroprene, divinylbisphenyl and trivinylbenzene.

Reconsideration and withdrawal of this rejection are thus respectfully requested.

#### **Claims 15-16**

Claims 15-16 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Fenton '136 in view of Roark et al. (U.S. 7,001,446) (hereinafter Roark '446). Applicants respectfully traverse.

The Examiner asserts that Roark '446 teaches a protective layer applied to a membrane to protect a catalyst from the "detrimental effects of feedstream and other contaminants". The Examiner further asserts that Roark '446 teaches that a protective layer of porous perovskites can be used to protect the membrane from poisoning. The Examiner argues that one of ordinary skill in the art would be motivated to use the protective layer materials of Roark '446 as the protective layer of Fenton '136 "to decrease fuel (feedstream) crossover".

Applicants respectfully submit that the Examiner has failed to establish a *prima facie* case of obviousness. As previously discussed, Fenton '136 fails to teach or suggest an ion exchange membrane as presently claimed, comprising a crosslinked ion exchange resin produced from at least one crosslinkable monomer selected from the group consisting of a polyfunctional vinyl monomer and a polyfunctional methacrylic acid derivative monomer, wherein the polyfunctional vinyl monomer is at least one selected from the group consisting of divinylbenzene, divinylsulfone, butadiene, chloroprene, divinylbisphenyl and trivinylbenzene. Roark '446 fails to cure these deficiencies.

Roark '446 is directed to a hydrogen-permeable membrane for separation of hydrogen from hydrogen-containing gases. Roark '446 does not disclose or suggest the inventive ion exchange membrane of the present application.

Evidently, the cited references, alone or in combination, fail to teach or suggest every limitation of the instant invention. For this reason alone, this rejection should be withdrawn.

Furthermore, assuming *arguendo* that Roark '446 cured the deficiencies of Fenton '136, it is noted that references cannot be arbitrarily combined. There must be some reason why one of ordinary skill in the art would be motivated to make the proposed combination of the primary and secondary references. *KSR Int'l Co. v Teleflex Inc.*, 82 USPQ2d 1385 (U.S. 2007). Courts have clearly established that, even when a combination of references teaches every element of a claimed invention, a rejection based on a *prima facie* case of obviousness is improper absent a motivation to combine. *Id.*

Fenton '136 is directed to porous membranes, whereas Roark '446 is directed to a non-porous multi-layer membrane. One skilled in the art would not be motivated to modify the

porous layers of Fenton '136 by using the materials disclosed by Roark '446 for non-porous membranes.

Because the invention, as set forth in Applicants' claims, is not disclosed or made obvious by the cited prior art, reconsideration and withdrawal of this rejection are respectfully requested.

**Conclusion**

All of the stated grounds of rejection have been properly traversed, accommodated, or rendered moot. Applicants therefore respectfully request that the Examiner reconsider all presently outstanding rejections and objections and that they be withdrawn. It is believed that a full and complete response has been made to the outstanding Office Action and, as such, the present application is in condition for allowance.


Should there be any outstanding matters that need to be resolved in the present application, the Examiner is respectfully requested to contact Craig A. McRobbie, Reg. No. 42,874 at the telephone number of the undersigned below, to conduct an interview in an effort to expedite prosecution in connection with the present application.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies to charge payment or credit any overpayment to Deposit Account No. 02-2448 for any additional fees required under 37.C.F.R. §§1.16 or 1.147; particularly, extension of time fees.

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Respectfully submitted,

By 

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